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BROWN ROT OF CAULIFLOWER

Charles Chupp and James G. Horsfall.

A trouble known to growers as brown=rot has been present to the extent of a trace during a number of years since cauliflower growing became prevalent in the Catskills, and has been severe in 1918, 1923, 1933, and to some extent in 1932. It was most destructive in 1933, when nearly a third of the crop was destroyed.

On September 27, 15 fields of cauliflower near New Kingston and Margaretville, Delaware County, New York, were visited, while a few weeks earlier 7 fields nearer Walton had been inspected. The visits were made at the request of the County Agricultural Agent and some of the fertilizer dealers because the growers insisted that applications of certain brands of the fertilizer gave more of the trouble than did others. The results of the inspections did not altogether corroborate this contention.

The first outward symptom of the brown-rot is a slight brownish discoloration at some spot on the head, which frequently is preceded by darkening or even dissolution of the pith of the stem leading to that particular part of the head. The browning gradually spreads over the entire head which remains firm until decay organisms enter. The taste of affected heads is exceedingly bitter. Frequently the bitterness extends beyond the limits of the browning. The discoloration and dissolution of the pith proceed rapidly until the stem may be hollow throughout its whole length. Later the surface of the head becomes slimy and finally the whole head decays. No odor as of rotting cabbage attends the malady until the slimy stage is reached. Leaves on affected plants frequently are yellowed between the veins causing the latter to stand out very prominently. Sometimes the leaves resemble those on plants affected with whiptail and the head sometimes may become ricey.

That the disease is probably not caused by a pathogenic organism is shown by the following observations: isolations in the laboratory by several persons independently in different years have not revealed the presence of such microorganisms; the disease seems to progress from the inside outward to the surface of the plant; and no pronounced odor is associated with the disease until rotting bacteria enter the tissues, apparently as secondary invaders.

Although growers seem fairly well agreed that the malady is not prevalent during dry seasons, at least during seasons that are dry at heading time, it may be significant that each year when the trouble was destructive, the average rainfall was less than normal during some part of the season. In 1933, the epiphytotic year, June and July together lacked more than four inches of the normal rainfall in Delaware County, while in August the rainfall was 5.86 inches above normal. It may be that the trouble is similar to tomato blossom-end rot, being worse following a sudden change in moisture. Such a relationship is suggested further by the fact that in severely affected fields the disease was less prevalent in 1933 on well drained knolls; whereas in slightly affected fields the malady was more prevalent in low, poorly drained areas, irrespective of treatments.

Since high temperatures are injurious to cauliflower, it is significant that the brown-rot occurs only in seasons during which the temperatures are higher than normal. The earlier the variety the greater likelihood there is of the heat injury and apparently the greater likelihood of brown rot.

In certain fields where the commercial fertilizer alleged by growers to cause brown rot was applied over the whole area, but only half of the field was covered with barnyard manure, the crop invariably was better where the manure was applied.

Brown rot seems to be associated directly with acid soils. This may account for the fact that the dry June and July helped to aggravate the trouble. If the hydrated lime, which is applied in great quantities just before the crop is planted does not become thoroughly incorporated with the soil, and therefore does not raise the pH sufficiently, there is injury to the cauliflower. Frequent early rains seem to aid in making the lime more quickly available but during the early part of this summer the rains were lacking. Soil acidity may further explain why the heavily manured parts of the field were better than the remainder, since the ammonia in the manure aids quickly in making the soil at least slightly more alkaline. The organic matter acts also as a buffer. There may be some truth in the growers' contention that certain fertilizers high in sulfate of ammonia, when applied at the rate of two or three tons an acre, may increase the brown rot on soils that were already inclined to be acid. A similar amount of nitrate of soda might in border-line cases maintain sufficient soil alkalinity for favorable cauliflower growth.

Control measures derived from these observations would consist at present in applying at least part of the lime a year in advance of the crop, in planting on well drained soil, or in using tile drainage, in applying barnyard manure when there is any doubt regarding soil alkalinity, and in applying fertilizer carrying most of the nitrogen in the form of nitrate of soda.

It would seem that the trouble on turnip as described by Hurst in the Report of the Division of Botany, Canada Department of Agriculture pp. 176-181, 1931, might possibly be similar to brown rot on cauliflower. (Oct. 25).

DISEASE SURVEY NOTES FOR SEPTEMBER IN MASSACHUSETTS

O. C. Boyd has sent the following report (Oct. 11):

The cool, wet weather during the latter half of August and during September proved exceedingly favorable for most of the diseases of our late summer and fall crops. Observations made during the month are recorded below:

VEGETABLES:

POTATOES: Late blight (Phytophthora infestans) became a factor this fall only in late varieties that were sprayed or dusted well and thus kept green until September. In many fields after protection had terminated, considerable new vine growth appeared during early September as a result of prolonged wet weather, and became blighted. With unusual rainfall accompanying the infection on the tops, considerable tuber rot is now being found at digging or in storage. Protection of the vines no doubt should have included at least two more applications late in the season than were generally made. Where fields were sprayed into September, the green tops have not blighted.

TOMATOES: Early blight (Alternaria solani) was generally pronounced, severe in many instances, on the old or early crop which matured around the first of the month. Less defoliation occurred, as usual, on staked or trellised plants.

Late blight (Phytophthora infestans) has been epidemic again over the State this fall, starting around the middle of August in the easternmost counties, and spreading westward. According to reports by growers and county agents, fields of late tomatoes began dying rapidly from this disease early in the latter half of August. By September 1, most of the late crops were destroyed by it, with scarcely any fruit picked. Occasional fields that had been sprayed or dusted several times, beginning when the disease first made its appearance, were still yielding tomatoes during the last week of September which were bringing $1.50 the half-bushel box. Late blight appeared in the Connecticut Valley about the first week in September, but did not spread so widely and rapidly as in the eastern part of the State. It may safely be estimated that at least 75 to 80 per cent of the rather extensively planted late crop of tomatoes in the State was destroyed by late blight. So far, much less damage has been done to the fall crop of hot-house tomatoes by this disease than in 1932.

This is the second successive year that late blight has proved disastrous to tomatoes in Massachusetts. In both 1932 and 1933, unusually cool, wet weather occurred in August and September, following hot dry periods earlier in the summer. Very little late blight occurred on potatoes anywhere in the state until around September 1, after most of the fields of late potatoes had died down. Considerable rot is now being found following the rains of September.

SQUASH (winter): Mycosphaerella citrullina, which causes black rot in storage, was unusually abundant on the vines during the month. The heavy prolonged rains of late August and during September no doubt were favorable to its spread. Judging from the extensive infection of the fruit stalks, considerable stem-end black rot can be expected to show up later on in storage, innrespective of fruit disinfection at harvest. More growers than ever are dipping their squash in formaldehyde this fall to reduce the amount of black rot in storage. Extensive field surveys during September indicate definite benefit from seed disinfection and crop rotation in reducing the amount of vine infection. The heaviest infections were observed where squash was grown in the same fields last year and the seed not treated. Considerable infection occurred where seed was treated but where only one year was devoted to other crops between squash crops, indicating the necessity of a longer interval in rotation.

CUCUMBER: Late plantings of cucumbers were injured by more than the usual amount of scab (Cladosporium cucumerinum) and anthracnose (Colletotrichum lagenarium) during late August and September. As a rule, downy mildew (Pseudoperonospora cubensis) which did not appear this year until after September 1, has killed the foliage of muskmelons and cucumbers by that date. Hence, the other two diseases had opportunity to inflict more late-season damage than in the average year.

MUSKMELON: Macrosporium leaf blight (M. cucumerinum) caused more damage to the fields generally during August and September than all other diseases combined. Few fields possessed green foliage on September 15, other than those that were properly protected with copper fungicides. Anthracnose and Mycosphaerella wilt were common but not very damaging. Downy mildew appeared too late to be a factor.

WATERMELON: Anthracnose was again this year the chief disease of this crop, causing severe spotting of the foliage and moderate pitting of the fruits.

CABBAGE, CAULIFLOWER: Scattered infections of black leg (Phoma lingam) have been observed during the month on late crops. Much more damage has been done by black rot (Bacterium campestre) especially to cauliflower. In those sections where the latter crop has been cultivated extensively for years, club root (Plasmodiophora brassicae) is the greatest single set-back. In such places, losses up to 50 per cent or more were not uncommon where old cauliflower fields were used or where long rotation was not practiced. This condition was observed even on relatively high, sandy soils. Club root seems to have fared unusually well in the late summer crops.

TURNIPS: The turnip crop on Cape Cod now shows considerably more damage from Cylindrosporium leaf spot (C. brassicae) than in the average season. The rainy weather of the past two months no doubt has been favorable to it. Black rot and black leg, while present, rarely ever cause appreciable damage on the Cape. Severe black rot, however, is now present in some fields in the Connecticut Valley.

CARROTS: Macrosporium leaf blight (M. carotae) causes more damage to this crop annually than all other field diseases combined. Yet it is destructive only in the Connecticut Valley and certain towns of the eastern part of the State very near large bodies of water. Losses ranging up to 50 per cent were not uncommon in the Valley this fall due to this disease. Damping-off caused considerable reduction of stand in the late-crop seedings.

CELERY: Throughout the summer and fall, early blight (Cercospora apii) has been more prevalent by far than late blight (Septoria sp.) In spite of the wet weather of August and September, both diseases have been kept under satisfactory control where spraying was frequent and thorough. Both summer and winter celery not properly protected have undergone greater loss than in the average season. At present, the green celery for pitting shows considerable early blight and only scattered infections of late blight. Although special effort is being made to keep the late plantings covered with spray or dust, the crop will have to be trimmed unusually close before going into storage this fall.

SPINACH: Considering the generally cool, wet weather in August and September, downy mildew (Peronospora effusa) has done comparatively little damage to the fall crop. It is too early yet, however, to estimate the amount of loss likely to occur. Damping-off, which in the past has caused marked reductions in stand, was very conspicuous on late seedings. Many growers tried out for the first time this year the red oxide of copper seed treatment, and in most instances striking results were secured. This treatment no doubt will be used much more extensively next year, on carrots as well as spinach.

FRUITS:

APPLES: Black rot (Physalospora malorum) and bitter rot (Glomerella cingulata) infections of the fruit are more common than usual this fall, even before harvest. Baldwin spot which caused heavy losses in storage last year is present on Baldwin now in many orchards. With the late-season rains we can again expect considerable to develop after harvest. Growers are being encouraged to delay picking susceptible varieties as long as possible. Scab (Venturia inaequalis)has not caused more damage during the season than in the average year. Considerable late infection is now showing up in some storages on McIntosh. This has been relatively an easy season to secure good control of scab.

Blight (Bacillus amylovorus): Only in the western half of the state has this disease been damaging to pears, apples and quinces. In Hampden County, marked losses have occurred in apples due to blossom and twig blight. In no other season has so much blossom blight been observed. One large Baldwin orchard showed at least 20 per cent reduction in fruit set, with some trees showing 50 per cent reduction and as much spur infection. Such trees appeared brown from the amount of twig blight, and possessed hundreds of infected spurs and twig cankers.

PEACH: Brown rot (Sclerotinia fructicola) developed abundantly on Elbertas and other late varieties where protection was not continued up to near picking. Trees in which pronounced blossom and twig blight occurred in the spring showed the most brown rot fruit infection this summer. In fact, during the latter part of August and the first two weeks of September, these spring cankers were producing an abundance of conidia. Special emphasis is now being placed upon full sanitation as a preventative measure; and next spring the importance of well timed pink sprays for the varieties coming into blossom at different times will be stressed. This year, the pink spray generally was timed for the later varieties, and the early ones became infected due to the delayed application.

Bacterial spot (Bacterium pruni) was considerably more in evidence this season than in our average year, even more damaging than in 1931 when unusual outbreaks occurred. Premature defoliation and spotting of the fruit was not uncommon in many orchards, especially in the eastern and southeastern parts of the state. Scab (Cladosporium carpophilum), which is always present in backyard and poorly sprayed trees, was of no consequence in commercial orchards.

STRAWBERRIES: Very little damage occurred from Botrytis this summer, the weather being generally dry during the picking season. Dwarf (Aphelenchoides fragariae), which again caused marked damage in scattered fields on Cape Cod, remained rather active during the entire summer this year, especially in the old beds being kept over for a second bearing crop. Definite symptoms with moderate nema populations were observed in September, being most pronounced on the recently developed buds and runner-sets. Black root, or root rot, was prevalent as usual during the rather dry picking season. This is no doubt the most widespread and damaging disease in our berries, considering the State as a whole. Root-knot (Heterodera marioni) and black root came into the state in abundance on plants shipped from certain outside nurseries; and both diseases continued to develop in our beds throughout the summer.

GRAPES: In spite of the wet weather in August and September, little more than the usual amount of black rot (Guignardia bidwellii) was observed generally. Downy mildew (Plasmopara viticola) on the other hand, became more or less widespread during the cool, wet season, and caused considerable defoliation. Delaware appeared to be strikingly susceptible; Worden resistant.

MYCOSPHAERELLA WILT AND ROT OF CUCURBITS

In Boyd's report on diseases in Massachusetts, (page 160) it is noted that Mycosphaerella citrullina was unusually abundant on squash vines during September, and that it is likely that considerable black rot will show up later in storage.

That the disease has also been prevalent in New York is indicated by a form letter recently received, signed by Charles Chupp, which stated that "Because of the extremely high temperatures during the growing seasons of 1931-32 and 33, the Mycosphaerella wilt of melons and cucumbers has become so prevalent and severe, that requests have been made for information regarding the fungus and its control."

TOBACCO DISEASES IN NORTH CAROLINA

Downy mildew (Peronospora hyoscyami) began as usual in the southeastern section of the State and continued to spread westward. It was more severe in the western counties than in 1932. It even reached the burley area this year, but did not cause any serious damage there. In the extreme western portion of the flue-cured area where the attack was bad in 1932 it was very severe this year, so much so that the growers had to come to the eastern part of the State to get sufficient plants to set out their small acreage.

In the eastern and southeastern sections of the State the seasons were such that the growers were able to get a much better stand from the diseased plants in 1933 than they did in 1932, but farther west the diseased plants did not do so well in the field, and in the extreme west affected plants did not live at all. I think that the serious trouble in the western part of the State was due to the combination of the severe attack of downy mildew with the poor seasonal conditions.

We did not make a single observation of any diseased plants in the field, in any section of the State, after the tobacco began to grow. In 1932 the same symptoms showed up in the field as in the seed bed.

Root knot (Heterodera marioni) is the most outstanding disease occurring throughout the entire tobacco area. It has actually caused more loss than all the rest of the diseases together, year after year. It is not quite as destructive this year as in previous years due to an abundance of rain during the later growth period.

Bacterial wilt (Bacterium solanacearum) seems to be spreading in most of the eastern counties, but not nearly so bad as in Durham, Wake, Granville, and Person Counties. The very coarse sandy loam soil and rolling fields of these counties seem to be more adapted to the rapid spread of bacterial wilt. (E. Y. Floyd, Oct. 16)

BACTERIAL WILT OF CORN IN MICHIGAN AND MASSACHUSETTS

MICHIGAN: There seems to be little difference in distribution of the disease this year from last year. We have found authentic specimens along the southern border of the state as well as in the upper peninsula at the Experiment Station at Chatham. Isolations have been made in each case and the organism identified as Aplanobacter stewartii. We have had much less correspondence than during the previous season. In Van Buren County the County Agricultural Agent reported that he has had practically no calls on bacterial wilt this year although he knew it was present to a considerable extent. It has been my observation that the actual damage from the standpoint of marketable ears was much less than the percentage of field infection indicated. In Monroe County in one field observed there was approximately 12 per cent infection, but the loss of marketable ears, that is, due to the killing of the plants, was less than 1 per cent.

In Monroe County and on the College Farm we tried out some 50 commercial varieties of sweet corn and found that the percentage of infection in these varieties of sweet corn might be grouped as follows:

Early varieties represented by Spanish Gold, Golden Gem, and Extra Early Bantam, 93 to 100 per cent. Mid-season varieties such as Sunshine and Golden Bantam, 64 to 91 per cent. Late mid-season varieties such as Barden Wonder, Golden Cross Bantam, Top Cross Bantam, and Bantam Evergreen, 23 to 45 percent. Varieties such as Evergreen, Stowell's Evergreen, Narrow Grain Evergreen, 10 to 29 per cent. In the variety Country Gentlemen secured from several different sources the infection averaged about 3 per cent. These data bear on the percentage of infection and not on actual loss to the crop. For example, Golden Cross and Top Cross Bantam showed 45 and 46 per cent infection respectively, although the actual loss in marketable ears was zero.

In one series we found that very early planting in cold wet soil with seed treated to prevent root rot produced the highest percentage of wilt-free plants as well as the highest percentage of marketable ears. These plantings were started on April 25 and replicated at weekly intervals until May 30. Because of an early warm season in April and May, plantings subsequent to the first one in late April showed very little difference between treated and untreated seed as far as percentage of wilt and stand of plants was concerned.

In Michigan the bacterial wilt problem is centered around the production of extra early varieties for the early green corn market, not the canning crop. Resistance or seeming resistance is closely correlated with length of time necessary to mature the crop. In other words, the earlier the variety, the more susceptible to wilt, regardless of when the corn is planted. (J. H. Muncie, Oct. 23).

MASSACHUSETTS: Bacterial wilt has been widespread, and in many fields and gardens, severe all summer long. It was, of course, most pronounced in the early yellow varieties generally and in the earlier plantings. Nevertheless, extensive secondary infection occurred in many plantings in August and September, causing light yield and poor filling of ears. As late as September 15, a field in Hampden County was observed, with plants about 12 inches high, with at least 50 per cent primary infection, the infected stalks being no more than half as tall and badly wilted. A large market gardener near Springfield, with 30 acres of an early yellow variety which showed no more than 2 per cent primary infection on June 20, later reported this field a total loss due to wilt. Apparently very early and extensive secondary infection occurred in order to cause such severe damage. All corn fields were badly infested with both thrips and flea beetles during June and July, and during August and September, with the beetle. (O.C. Boyd, Oct. 11).

LEAF VARIEGATION OF THE BLAKEMORE STRAWBERRY FOUND IN LOUISIANA

The appearance in Maryland, Virginia, North Carolina, Arkansas, and Oklahoma of a leaf variegation of unknown cause on the Blakemore strawberry was noted in the preceding issue of the Reporter (pp. 145-147). A. G. Plakidas now reports its occurrence in Louisiana. Writing on October 23, he said:

"I found the Blakemore leaf variegation in two places. At the Louisiana Agricultural substation in Hammond in a small planting of 12 mother plants (each plant having 5 to 15 runner daughter plants) one mother plant and its 14 runner plants were found affected. These Blakemore plants were obtained from Chattanooga, Tennessee, last March.

"The second find was near Mandeville, Louisiana. Six mother plants, and their runners, were found in a planting of about 1,000 plants. These plants, also, were obtained from Chattanooga last March. The affected plants were not very yellow - not nearly so yellow as the Howard 17 in spring and early summer in Massachusetts - but still sufficiently discolored to be picked out even by an inexperienced observer.

"The only other Blakemore planting found was a patch of about 800 plants near Slidell, Louisiana. The original plants for this patch were obtained from the Coastal Plain Station, North Carolina, in 1929. No yellows plants were found in this patch."

Additional information concerning the trouble in Arkansas has also been received. V. H. Young wrote on October 17: "The Arkansas Plant Board reports a considerable amount of "suspected mosaic" on Blakemore strawberries near Leachville, Mississippi County, Ark. This is just across the Mississippi River from Tennessee and at the opposite side of the state from points where previous reports were made." Later, he reported, "Mr. Millar of the State Plant Board reports one field of Blakemore strawberries badly affected with "suspected mosaic" near Judsonia, Arkansas, but states that most of the fields of Blakemores in that section are free. The Judsonia section is probably our most important strawberry plant shipping section."

And Ray D. Johnston, County Agent at Greenwood, Arkansas, wrote under date of October 21:

"In checking over the conditions here I find that practically all of the fields in which this trouble has shown up are ones in which the plants were received from growers in White County, Arkansas. The plants were certified and appeared to be of excellent quality.

"The "off color" showed up during the summer among plants at random over the patch with the mother plant and all new plants set by runners from this plant showing, apparently, the same characteristics.

"Up until recently the 'yellow' plants seemed to be as vigorous as any others in the patch but now it seems that they aren't doing as well as the others."

CITRUS CANKER IN TEXAS

On September 30, J. M. Del Curto reported finding canker in Galveston, Texas, and submitted specimens from which the organism, Bacterium citri, was isolated by H. R. Fulton. Further details regarding this outbreak, from a recent letter from Mr. Del Curto, are as follows:

"Rather scattered infections of canker have been found in over a fifteen-mile area involving the corners of Galveston, Brazoria, and Harris Counties where they join. Infections were found in two nurseries in this area, and the stock in these nurseries has been quarantined. The infected trees, together with those nearby within a small radius, have been destroyed and the other trees are being observed frequently. The majority of the nursery stock involved consists of satsumas, although . . . there is a scattering of round oranges and grapefruit in portions of the nurseries.

"The section involved is more or less isolated by great stretches of pastureland, and we are attempting to complete the eradication in as prompt and effective a manner as circumstances in this area will permit." (K. F. Kellerman)

APPLE DISEASES IN MAINE

Non-parasitic leaf scorch. Complaints were received about a leaf scorch, occurring in commercial orchards, not necessarily due to spray injury. Upon investigation, in some orchards claimed to be treated the same throughout, the writer found the trouble somewhat localized in groups of trees, single trees, and parts of trees. Sometimes all the shoots of one branch were conspicuously affected while other shoots with which they were intermingled were quite healthy. Such a branch was sometimes found in a shaded position in an experimental orchard. In this orchard, where spray burn varied with the kind of spray treatment and with the individual tree in the same spray plot, the leaf scorch was found on untreated check trees and

often was restricted to the middle leaves of long shoots of the current year's growth. This leaf scorch consists essentially of a killing and browning occurring in a marginal band, along the midrib, between the midrib and margin, over an entire half of a leaf, or over the whole leaf. The name leaf scorch is suggested in the description of an apparently similar malady reported from Australia (E.S.R. 68:775) and the physiological nature of the cause is suggested by the localization referred to.

Calyx-end blackening: A calyx-end blackening was reported from commercial apple orchards in September. The writer found about 10 per cent of the reddening fruits affected in one orchard. The fungus Alternaria mali Roberts (identification of cultures being confirmed by John W. Roberts) was isolated from three-fourths of the lesions and from fruits from different orchards. In experimental plots the injury was correlated this year with the kind of spray treatment, as reported in Maine Agr. Exp. Sta. Bull. 189 in 1911. It resembles that ascribed to arsenical compounds in the Northwest. (Donald Folsom)

LEAF DISEASES OF TREES IN NEW JERSEY

Three leaf diseases of trees are reported as unusually important in 1933 by R. P. White in the September issue of the Nursery Disease Notes of the New Jersey Agricultural Experiment Station. The elm leaf spot, Gnomonia ulmea, appeared in epidemic form much earlier in the season than normally and caused early defoliation. As a result, many elm trees are going into the winter in a much weakened condition. This is significant from the standpoint of the prevention of the spread of the Dutch elm disease by the European elm bark beetle which breeds in weakened trees.

The other diseases mentioned as unusually severe are the horse chestnut leaf blotch, Guignardia aesculi, and the leaf spot of hawthorn, Entomosporium thuemenii.

THE DUTCH ELM DISEASE

During the calendar year 1933 and up to October 26, 1933, trees affected with the Dutch elm disease (Graphium ulmi) have been confirmed by laboratory cultures as follows:

New Jersey	618
New York	47
Ohio	1
Connecticut	1
Maryland	1

The tree in Connecticut is barely across the New York-Connecticut line. The tree in Maryland is in the grounds of Fort McHenry in Baltimore not far from the piers at which infected elm logs were unloaded this summer. A tree in Maine suspected of having this disease is not confirmed. (R. Kent Beattie).

RUSTS OF ALABAMA

Following is a partial list of rusts collected in Alabama by Dr. G. W. Carver of Tuskegee Institute. The determinations were made by Paul R. Miller. It will be noted that several are new for the State.

	Host	Fungus
1.	Juncus tenuis	Uromyces silphii Arth. New for State.
2.	Lespedeza repens	Uromyces lespedezae-procumbentis M. A. Curt.
3.	Rumex acetosella	Puccinia acetosae Körn.
4.	Medicago lupulina	Uromyces striatus Schrt.
5.	Xanthium chinense	Puccinia xanthii Schw.
6.	Ficus carica	Uredo fici Cast.
7.	Lolium perenne	Puccinia coronata Corda. New for State.
8.	Andropogon scoparius	Puccinia andropogi (Schw.) Kuntze
9.	Hypericum mutilum	Uromyces hyperici-frondosi Arth.
10.	Diodia teres	Uromyces spermacoces (Schw.) Arth.
11.	Holcus halepensis	Puccinia purpurea Cke.
12.	Gnaphalium purpureum	Puccinia hieracii Schm.
13.	Solidago canadensis	Aecidium asterum Schw.
14.	Prunus serotina	Tranzschelia punctata (Pers.) Arth.
15.	Lespedeza stuvei	Uromyces lespedezae-procumbentis (Schw.) Arth.
16.	Hordeum pusillum	Uromyces hordeinus (Arth.) Barth.
17.	Antirrhinum majus	Puccinia antirrhini Diet. & Holw. New for Stat
18.	Fragaria indica	Kuehneola duchesneae Arth.
19.	Salix nigra	Melampsora humboldtiana Speg.
20.	Sambucus canadensis	Puccinia sambuci Arth.
21.	Lorinseria areolata	Uredinopsis mirabilis (Peck) Magn. New for Stat
22.	Eragrostis capillaris	Uromyces eragrostidis Tracy. New for State.
23.	Homalocenchrus virginicus	Uromyces halstedii Arth.
24.	Alsine media	Melampsorella elatina (Alb. & Schw.) Arth.

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